IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	Louis B. Rosenberg et al
Application No.	:	09/153,781
For	:	**Networked Applications Including Haptic Feedback**
Filed	:	September 16, 1998
Examiner	:	Regina Liang
Art Unit	:	2629

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APPEAL BRIEF

Sir:

This is an Appeal Brief filed under 37 C.F.R. § 41.37 in connection with the final rejection of claims 12-15, 17-23, 25, 36-40., 42 ,43, 58-70, 72-76, 78-82, 92-96, 98-111, 113-116, 120, and 121 in the Non-Final Office Action mailed December 18, 2008 (hereinafter the "Non-Final Office Action"). Each of the topics required by 37 C.F.R. § 41.37 is presented herewith and labeled appropriately.

Real Party in Interest

The real party in interest in the present application is the assignee, Immersion Corporation, 801 Fox Lane, San Jose, California 95131 (hereinafter "Appellant").

Related Appeals and Interferences

Appellant and the Appellant's legal representative know of no appeals or interferences that will directly affect, will be directly affected by, or have a bearing on the Board's decision in this appeal.

Status of Claims

Claims 12-15, 17-23, 25, 36-40, 42, 43, 58-70, 72-76, 78-82, 92-96, 98-111, 113-116, 120, and 121 (listed in Appendix A) stand rejected and are the substance of this appeal. The rejection of claims 12-15, 17-23, 25, 36-40., 42 ,43, 58-70, 72-76, 78-82, 92-96, 98-111, 113-116, 120, and 121 is appealed.

Status of Amendments

Applicant has not sought to amend the claims after the mailing of the Non-Final Office Action.

Summary of the Claimed Subject Matter

The present application relates generally to providing peer-to-peer force feedback over a computer network. For example, in one disclosed embodiment, two host computer systems are connected by a network connection for playing a paddleball game. [1] Each host computer system has a display to display the players' paddles and a ball, and each host computer system is connected to a force feedback interface device that a user uses to control a paddles. Each player uses his respective force feedback device to control his paddle and uses it to hit a ball displayed on his computer screen past his opponent to score points. Information is passed between the host computer systems for updating the graphical display of the game on each player's display and for outputting haptic effects by the force feedback device. Other disclosed embodiments include multi-player, networked, force feedback-enabled applications that include transmission of force feedback information between multiple computers participating in the interactions.[2]

[1] *See*, e.g., Specification, p. 24, line 1 to p. 25, line 12; Figures 12a-b.
[2] *See*, e.g., Specification, p. 24, line 1 to p. 27, line 9; Figures 12a-b.

Of the claims on appeal, claims 12, 17, 38, 58, 75, 101, 102, 103, 120, and 121 are independent claims. Summaries of the subject matter claimed in each of these independent claims is given below.

Claim 12 recites a system comprising "a first computer means coupled to a network means." The specification describes that a computer means can be a client machine, such as, for example, a personal computer, a television configured for network access, or a video game console (e.g. a Nintendo™ game machine).[3] The specification describes a variety of potential network means, including the Internet[4], local area network[5], or other bi-directional network connection, such as Ethernet or over a telephone line[6].

The next element of claim 12 recites "a second computer means coupled to said network means, said second computer means remote from said first computer means, said second computer means configured to produce a graphical environment, wherein said graphical environment is based, at least in part, on information transferred from said first computer means to said second computer means over said network means." The specification recites that two remote client devices may communicate over a network. A second computer means may comprise a client machine, such as, for example, a personal computer, a television configured for network access, or a video game console (e.g. a Nintendo™ game machine).[7] A second computer means may also comprise a web server machine.[8] The specification discloses that the second computer means is configured to produce a graphical environment, and where the graphical environment is based in part on information transferred between the two computer means.[9] For example, the specification discloses that, in one embodiment, the second computer may provide a graphical environment described using Virtual Reality Modeling Language (VRML).[10]

Claim 12 recites "human/computer interface means, wherein said human/computer interface means comprises an actuator means." The specification recites that a human/computer

[3] *See*, e.g., Specification, p. 8, lines 24-36; p. 9, lines 3-26, Figures 2, 3.
[4] *See*, e.g., Specification, p. 8, lines 12-15.
[5] *See*, e.g., Specification, p. 7, lines 6-10.
[6] *See*, e.g., Specification, p. 9, lines 5-8 , p. 22, lines 5-10.
[7] *See*, e.g., Specification, p. 8, lines 24-36; p. 9, lines 3-26, Figures 2, 3.
[8] *See*, e.g., Specification, p. 8, lines 29-32
[9] *See*, e.g., Specification, p. 11, lines 20-36; p. 21, line 16 to p. 22, line 2.
[10] *See*, e.g., Specification, p. 20, lines 18-25.

interface device comprising an actuator means may be connected to each of the client machines.[11]

The next portion of claim 12 recites "said second computer means further comprising means for interpreting haptic feedback information repeatedly received from said first computer means over said network means, updating said graphical environment based, at least in part, on said information, and causing said actuator to generate a physical feel sensation at said human/computer interface means based, at least in part, on said haptic feedback information." The specification discloses that force feedback information can be repeatedly transmitted from a first computer means to a second computer means over the network means.[12] For example, the specification recites that a user at a first computer can give a massage to a user at a second computer.[13] In such an embodiment, force information is transmitted over the course of the massage from the first computer to the second computer, as well as from the second computer to the first computer. The specification also discloses that the second computer means can update the graphical environment based at least in part on information received from the first computer means.[14] For example, the specification discloses that each computer may transmit information relating to the "position, orientation, motion, or state characteristics" of an interface device to the other computer to update the graphical environment.[15] The specification further discloses that the haptic feedback information exchanged between the computers can be used to generate physical feel sensations at the other computer.[16]

Claim 17 recites a method for providing haptic feedback. The first element of claim 17 recites "receiving a remote computer information from a first computer at a second computer over a network, wherein said first computer is remote from said second computer, and wherein said remote computer information comprises information representing haptic feedback information." The specification discloses first and second computers being connected over a

[11] *See*, e.g., Specification, p. 9, lines 13-20; Figures 2, 3, 4a-b, and 5a-c, .
[12] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[13] *See*, e.g., Specification, p. 25, lines 33 to p. 27, line 9.
[14] *See*, e.g., Specification, p. 24, lines 1-25; Figures 12a-b.
[15] *See*, e.g., Specification, p. 21, line 33 to p. 22, line 15.
[16] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.

network.[17] The specification also discloses receiving information including haptic feedback information.[18]

The next recited step of claim 17 recites "generating a graphical environment." The present application discloses generating a graphical environment. For example, the specification recites that a computer generates a graphical environment, such as "a web browser, simulation, or game application."[19]

Claim 17 recites "receiving an input information at said second computer from a haptic feedback device." The specification discloses that input information may be received at each computer connected to the network from a haptic feedback device.[20]

The fourth element of claim 17 recites "using a haptic feedback signal to be provided to said haptic feedback device from said second computer, said haptic feedback signal being based, at least in part, on said remote computer information and said input information, wherein said haptic feedback signal causes said haptic feedback device to output haptic feedback." The specification discloses that force feedback information can be received from a first computer at a second computer over a network.[21] The specification further discloses that the haptic feedback information received from a remote computer can be used to generate haptic feedback to a user at the local computer.[22] The specification also discloses that haptic feedback can also be based on input information received from the local computer.[23]

Independent claim 38 recites a method for providing haptic feedback between a first computer and a second computer. The method recited in claim 38 first lists a step for "sending a first computer information to said second computer over a network, wherein said first computer information comprises haptic feedback information, wherein said first computer is remote to said second computer." The specification discloses first and second computers being connected over a network, i.e. remotely.[24] The specification also discloses sending information including haptic feedback information.[25]

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[17] *See*, e.g., Specification, p. 8, lines 24-36; p. 9, lines 3-26; p. 8, lines 12-15 Figures 2, 3.
[18] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[19] *See*, e.g., Specification, p. 11, lines 20-36; p. 21, line 16 to p. 22, line 2.
[20] *See*, e.g., Specification, p. 9, lines 15-18; p. 14, lines 21-27.
[21] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[22] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[23] *See*, e.g., Specification, p. 23, lines 28-38.
[24] *See*, e.g., Specification, p. 8, lines 24-36; p. 9, lines 3-26; p. 8, lines 12-15 Figures 2, 3.
[25] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.

Claim 38 further recites "causing a first haptic feedback signal to be sent to a second haptic feedback device from said second computer, said first haptic feedback signal being based, at least in part, on said first computer information, wherein said first haptic feedback signal causes said second haptic feedback device to output a haptic sensation." The specification discloses that force feedback information can be transmitted from a first computer to a second computer over a network.[26] The specification further discloses that the haptic feedback information exchanged between the computers can be used to generate haptic sensations at the other computer.[27]

The third element of claim 38 recites "sending a second computer information to said first computer over said network, wherein said second computer information comprises a position of a manipulandum of a second haptic feedback device." The specification discloses that each computer may transmit information, such as information relating to the "position, orientation, motion, or state characteristics" of an interface device to the other computer.[28]

The last element of claim 38 recites "causing a second haptic feedback signal to be sent to said first haptic feedback device from said first computer, said second haptic feedback signal being based, at least in part, on said second computer information, wherein said haptic feedback signal causes said first haptic feedback device to output a haptic sensation." As discussed above, the specification discloses that force feedback information can be transmitted from one computer to a another computer means over a network.[29] The specification further discloses that the haptic feedback information exchanged between the computers can be used to generate physical feel sensations at the other computer.[30]

Claim 58 recites a method for providing haptic feedback. The first element of claim 58 recites "receiving a first computer information from a first computer at a server computer over a network." The specification discloses that two client computers may interact through a server computer, such as a web server.[31] In such an embodiment, the server computer receives information from a first computer over a network.

The second element of claim 58 recites:

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[26] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[27] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[28] *See*, e.g., Specification, p. 21, line 33 to p. 22, line 15.
[29] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[30] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[31] *See*, e.g., Specification, p. 7, line 24 to p. 8, line 11; p. 28, lines 16-36.

> providing said first computer information to a second computer, wherein said first computer is remote from said second computer, wherein said first computer information comprises haptic feedback information and information operable to update a simulated graphical object in a graphical environment output by said second computer, and wherein at least one of said second computer and said server computer uses said first computer information to update a game program running on at least one of said second computer and said server computer, and wherein said second computer provides a second haptic feedback signal based at least in part on said first computer information to a second haptic feedback device

The specification discloses that information received from the first computer can be provided to the second computer by the server computer.[32] For example, the specification discloses that a user of a first computer can select a force sensation to be sent to a second computer and to be output by the force feedback device at the second computer.[33] The specification further discloses that embodiments described in the peer-to-peer context can be implemented using a web server. For example, VRML graphical environments may be used by two or more computers and the environment may be hosted by a web server, such that users at the different client computers can interact with the graphical environment executed by the server and can send haptic information between the two clients and the server.[34]

The third element of claim 58 recites "receiving a second computer information from said second computer over said network." The specification discloses that two client computers may interact through a server computer, such as a web server.[35] In such an embodiment, the server computer receives information from a second computer over a network.

The last element of claim 58 recites:

> providing said second computer information to said first computer, wherein said second computer information comprises haptic feedback information and information operable to update a simulated graphical object in a graphical environment output by said first computer, and wherein at least one of said first computer and said server computer uses said second computer information to update a game program running on at least one of said first computer and said server computer, and wherein said first computer provides a first haptic feedback signal based at least in part on said second computer information to a first haptic feedback device.

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[32] *See*, e.g., Specification, p. 28, 16-31.
[33] *Id.*
[34] *See*, e.g., Specification, p. 20, lines 16-35.
[35] *See*, e.g., Specification, p. 7, line 24 to p. 8, line 11; p. 28, lines 16-36.

The specification discloses that information received from the second computer can be provided to the first computer by the server computer.[36] For example, the specification discloses that a user of a second computer can select a force sensation to be sent to a first computer and to be output by the force feedback device at the second computer.[37] The specification further discloses that embodiments described in the peer-to-peer context can be implemented using a web server. For example, VRML graphical environments may be used by two or more computers and the environment may be hosted by a web server, such that users at the different client computers can interact with the graphical environment executed by the server and can send haptic information between the two clients and the server.[38]

Independent claim 75 recites a method for providing haptic feedback over a computer network. The first element of claim 75 recites "receiving a first information from a remote computer over a network, said first information comprising haptic feedback information and position information for a graphical object displayed by said remote computer." The specification discloses that force feedback information can be transmitted from a first computer means to a second computer means over the network means.[39] The specification also discloses that each computer may transmit information relating to the position of a graphical object to the other computer.[40]

The second element of claim 75 recites "using said first information to update a visual display." The specification discloses that a computer updates a graphical environment based on information received from a remote computer.[41]

The third element of claim 75 recites "providing a haptic feedback signal based at least in part on said haptic feedback information to a haptic feedback device, wherein said haptic feedback device outputs a tactile sensation based, at least in part, on said haptic feedback signal and correlated with said updated visual display." The specification further discloses that the haptic feedback information exchanged between the computers can be used to generate tactile

[36] *See*, e.g., Specification, p. 28, 16-31.
[37] *Id.*
[38] *See*, e.g., Specification, p. 20, lines 16-35.
[39] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[40] *See*, e.g., Specification, p. 24, line 1 to p. 25, line 32.
[41] *See*, e.g., Specification, p. 24, lines 1-25; Figures 12a-b.

sensations at the other computer.[42] It further discloses that the tactile sensations can be output to correlate with the update of the display of a graphical environment.[43]

The fourth element of claim 75 recites "sending a second information to said remote computer over said network." For example, the specification discloses that each computer may transmit information relating to the "position, orientation, motion, or state characteristics" of an interface device to the other computer.[44] The specification also discloses sending information including haptic feedback information.[45]

Independent claim 101 recites a method. The first element of claim 101 recites "executing a first local model of a computer-gaming simulation on a first computer in communication with a network." The specification discloses that two or more computers may each execute a local model of a computer-gaming simulation, and that each of the computers may be connected to each other over a network.[46]

The second element of claim 101 recites "executing, substantially simultaneously with said first local model, a second local model of said computer-gaming simulation on a second computer in communication with said first computer over said network, said second computer remote from said first computer." The specification discloses that two or more computers may each execute a local model of a computer-gaming simulation, and that each of the computers may be connected to each other over a network.[47]

The third element of claim 101 recites "updating a location of a first graphical object of said first local model based at least in part on position data output by a sensor in communication with a haptic input device in communication with said first computer, said haptic input device comprising an actuator configured to output haptic feedback to said haptic input device." The specification discloses updating a graphical environment and graphical display at a first computer based on information received from a user input device of a second computer, where the user input device comprises an actuator. [48]

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[42] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[43] *See*, e.g., Specification, p. 23, lines 28-38; p. 24, lines 1-25; Figures 12a-b.
[44] *See*, e.g., Specification, p. 21, line 33 to p. 22, line 15.
[45] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[46] *See*, e.g., Specification, p. 24, line 1 to page 25, line 32.
[47] *Id.*
[48] *See*, e.g., Specification, p. 23, lines 3-38; p. 24, lines 1-25; Figures 12a-b.

The fourth element of claim 101 recites "updating a location of a second graphical object based at least in part on information received over said Internet from said second network interface of said second computer, said information comprising a gaming event." The specification discloses updating a location of a second graphical object based on information received from another computer based on a gaming event.[49] For example, the specification discloses updating the location of a paddle and a ball in a paddle game based on information received from another computer.[50] The specification also discloses that two ends of a rope may be pulled by users at different computers connected by a network.[51]

The fifth element of claim 101 recites "determining, by said first computer, whether said first graphical object and said second graphical object interact." The specification discloses that a computer determines when its user's paddle interacts with a ball in a paddle game, or with an opponent's paddle.[52]

The sixth element of claim 101 recites that if there is an interaction between the first and second graphical objects, "determining a haptic effect to be output based at least in part on haptic information received from said second computer." The specification discloses that a haptic effect is determined based on the interaction and the haptic information received from the other computer.[53]

The last element of claim 101 recites "outputting said haptic effect to said haptic input device, said haptic effect configured to be substantially synchronized with said gaming event." The specification discloses that a determined haptic effect may be output substantially synchronized with the gaming event to provide a more realistic gaming experience.[54]

Independent claim 102 recites a system. The first element of the system of claim 102 recites "a first computer." The specification discloses computers.[55]

The second element of claim 102 recites "a first processor in communication with a network." The specification discloses a first computer comprising a first processor in communication with a network.[56]

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[49] *See*, e.g., Specification, p. 24, line 1 to p. 25, line 32.
[50] *See*, e.g., Specification, p. 24, lines 13-36.
[51] *See*, e.g., Specification, p. 25, lines 13-32.
[52] *See*, e.g., Specification, p. 24, line 13 to p. 25, line 32.
[53] *Id.*
[54] *Id.*
[55] *See*, e.g., Specification, p. 8, line 24 to p. 10, line 15.

The third element of claim 102 recites "a first memory coupled to said first processor." The specification discloses that processors are in communication with memory.[57]

The fourth element of claim 102 recites "a first force feedback device in communication with said first processor, said first force feedback device configured to provide a first input signal, said first force feedback device coupled to a first actuator, said first actuator configured to provide tactile sensations in response to a first haptic feedback signal." The specification discloses that a first computer may comprise a force feedback interface device comprising an actuator and to provide tactile sensations in response to a haptic feedback signal.[58]

The fifth element of claim 102 recites that the processor is configured to "produce a first image." The specification recites that a computer is configured to generate images to be displayed on a display device, such as a display of a web page, video game, or a simulation.[59]

The sixth element of claim 102 recites that the processor is configured to "provide said first haptic feedback signal to said first force feedback device, said first image and said first haptic feedback signal based at least in part on a first information received from a second computer over said network and based at least in part on said first input signal, said first information comprising haptic feedback information." The specification discloses that a computer can update the graphical environment based at least in part on information received from another computer.[60] For example, the specification discloses that each computer may transmit information relating to the "position, orientation, motion, or state characteristics" of an interface device to the other computer to update the graphical environment.[61] The specification further discloses that the haptic feedback information can be exchanged between the computers can be used to generate haptic feedback by a force feedback device.[62]

The seventh element of claim 102 recites "said second computer remote from said first computer." The specification recites that multiple computers may be remote from each other and in communication with each other, such as over a network.[63]

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[56] *Id.*; Figures 2 and 3.
[57] *See*, e.g., Specification, p. 8, lines 3-12; Figure 2.
[58] *See*, e.g., Specification, p. 9, line 33 to p. 10, line 32; Figure 3.
[59] *See*, e.g., Specification, p. 9, lines 8-11; p. 21, lines 23-26.
[60] *See*, e.g., Specification, p. 24, lines 1-25; Figures 12a-b.
[61] *See*, e.g., Specification, p. 21, line 33 to p. 22, line 15.
[62] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[63] *See*, e.g., Specification, p. 21, lines 1-32; Figures 1 and 11.

The eighth and ninth elements of claim 102 recites that the second computer comprises "a second processor, in communication with a network." The specification discloses a second computer comprising a second processor in communication with a network.[64]

The tenth element of claim 102 recites that the second computer comprises "a second memory coupled to said second processor." The specification discloses that processors are in communication with memory.[65]

The eleventh element of claim 102 recites "a second force feedback device coupled to said second processor, said second force feedback device configured to provide a second input signal, said second force feedback device coupled to a second actuator, said second actuator configured to provide a tactile sensation in response to a second haptic feedback signal." The specification discloses that each computer may be in communication with a force feedback device having an actuator, where the force feedback device provides input signals to the computer and outputs haptic effects.[66]

The twelfth element of claim 102 recites that the second processor is configured to "produce a second image." The specification recites that multiple computers may generate images to be displayed on a display device, such as a display of a web page, video game, or a simulation.[67]

The last element of claim 102 recites that the second processor is configured to "provide said second haptic feedback signal to said second interface device, said second image and said second haptic feedback signal based at least in part on a second information received from said first computer over said network and based at least in part on said second input signal, said second information comprising haptic feedback information." The specification discloses that a computer can update the graphical environment based at least in part on information received from another computer.[68] For example, the specification discloses that each computer may transmit information relating to the "position, orientation, motion, or state characteristics" of an interface device to the other computer to update the graphical environment.[69] The specification

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[64] *Id.*
[65] *See*, e.g., Specification, p. 8, lines 3-12; Figure 2.
[66] *See*, e.g., Specification, p. 10, lines 16-32; Figures 1-3, 11.
[67] *See*, e.g., Specification, p. 9, lines 8-11; p. 21, lines 23-26; p. 22, lines 16-26.
[68] *See*, e.g., Specification, p. 24, lines 1-25; Figures 12a-b.
[69] *See*, e.g., Specification, p. 21, line 33 to p. 22, line 15.

further discloses that the haptic feedback information can be exchanged between the computers can be used to generate haptic feedback by a force feedback device.[70]

Independent claim 103 recites a system. The first element of claim 103 recites "a first computer." As discussed above, the specification discloses computers.[71]

The second element of claim 103 recites "a first processor capable of generating a first image signal, said first processor in communication with a network." The specification recites that a computer is configured to generate images to be displayed on a display device, such as a display of a web page, video game, or a simulation[72] and that a first computer comprising a first processor may be in communication with a network.[73]

The third element of claim 103 recites "a first force feedback device capable of providing a first input signal, comprising: a first actuator configured to provide tactile sensations in response to a first haptic feedback signal." The specification discloses force feedback devices that are capable of providing input signals to a computer.[74] The specification further discloses that such a force feedback device comprises an actuator.[75]

The fourth element of claim 103 recites "said first image signal and said first haptic feedback signal based at least in part on a first information received from a second computer over said network and based at least in part on said first input signal, said first information comprising haptic feedback information." The specification discloses that a computer can update the graphical environment based at least in part on information received from another computer.[76] For example, the specification discloses that each computer may transmit information relating to the "position, orientation, motion, or state characteristics" of an interface device to the other computer to update the graphical environment.[77] The specification further discloses that the haptic feedback information can be exchanged between the computers can be used to generate haptic feedback by a force feedback device.[78]

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[70] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[71] *See*, e.g., Specification, p. 8, line 24 to p. 10, line 15.
[72] *See*, e.g., Specification, p. 9, lines 8-11; p. 21, lines 23-26.
[73] *Id.*; Figures 2 and 3.
[74] *See*, e.g., Specification, p. 10, lines 16-32; Figures 1-3, 11.
[75] *See*, e.g., Specification, p. 9, lines 27-32; Figure 3.
[76] *See*, e.g., Specification, p. 24, lines 1-25; Figures 12a-b.
[77] *See*, e.g., Specification, p. 21, line 33 to p. 22, line 15.
[78] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.

The fifth element of claim 103 recites " a second processor capable of generating a second image signal, said second processor in communication with said network." The specification recites that multiple computers may be remote from each other and in communication with each other, such as over a network.[79]

The sixth element of claim 103 recites "a second force feedback device capable of providing a second input signal to said second processor, comprising: a second actuator configured to provide tactile sensations in response to a second haptic feedback signal." The specification discloses that each computer may be in communication with a force feedback device having an actuator, where the force feedback device provides input signals to the computer and outputs haptic effects.[80]

The last element of claim 103 recites "said second image and said second haptic feedback signal based at least in part on a second information received from said first computer over said network and based at least in part on said second input signal, said second information comprising haptic feedback information." The specification discloses that a computer can update the graphical environment based at least in part on information received from another computer.[81] For example, the specification discloses that each computer may transmit information relating to the "position, orientation, motion, or state characteristics" of an interface device to the other computer to update the graphical environment.[82] The specification further discloses that the haptic feedback information can be exchanged between the computers can be used to generate haptic feedback by a force feedback device.[83]

Independent claim 120 recites a device. The first element of the device of claim 120 comprises "a processor." The specification describes devices comprising processors.[84]

The second element of claim 120 recites "receive a first information from a remote processor over a network, said first information comprising haptic feedback information and position information for a graphical object to be displayed." The specification discloses that force feedback information can be transmitted from a first computer means to a second computer

[79] *See*, e.g., Specification, p. 21, lines 1-32; Figures 1 and 11.
[80] *See*, e.g., Specification, p. 10, lines 16-32; Figures 1-3, 11.
[81] *See*, e.g., Specification, p. 24, lines 1-25; Figures 12a-b.
[82] *See*, e.g., Specification, p. 21, line 33 to p. 22, line 15.
[83] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[84] *See*, e.g., Specification, p. 9, lines 3-5, lines 21-34

means over the network means.[85] The specification also discloses that each computer may transmit information relating to the position of a graphical object to the other computer.[86]

The third element of claim 120 recites "update a visual display coupled to said processor based at least in part on said first information." The specification discloses that a computer updates a graphical environment based on information received from a remote computer.[87]

The fourth element of claim 120 recites "generate a haptic feedback signal based at least in part on said haptic feedback information, said haptic feedback signal configured to cause a haptic feedback device to output a tactile sensation based at least in part on said haptic feedback signal and correlated with said updated visual display." The specification further discloses that the haptic feedback information exchanged between the computers can be used to generate tactile sensations at the other computer.[88] It further discloses that the tactile sensations can be output to correlate with the update of the display of a graphical environment.[89]

The last element of claim 120 recites "transmit a second information over said computer network." For example, the specification discloses that each computer may transmit information relating to the "position, orientation, motion, or state characteristics" of an interface device to the other computer.[90] The specification also discloses sending information including haptic feedback information.[91]

Independent claim 121 recites a computer-readable medium comprising program code to cause a processor to perform a method. The first element of claim 121 recites "receive a first information from a remote processor over a network, said first information comprising haptic feedback information and position information for a graphical object displayed by said second computer." The specification discloses that force feedback information can be transmitted from a first computer means to a second computer means over the network means.[92] The specification also discloses that each computer may transmit information relating to the position of a graphical object to the other computer.[93]

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[85] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[86] *See*, e.g., Specification, p. 24, line 1 to p. 25, line 32.
[87] *See*, e.g., Specification, p. 24, lines 1-25; Figures 12a-b.
[88] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[89] *See*, e.g., Specification, p. 23, lines 28-38; p. 24, lines 1-25; Figures 12a-b.
[90] *See*, e.g., Specification, p. 21, line 33 to p. 22, line 15.
[91] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[92] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[93] *See*, e.g., Specification, p. 24, line 1 to p. 25, line 32.

The second element of claim 121 recites "update a visual display based at least in part on said first information." The specification discloses that a computer updates a graphical environment based on information received from a remote computer.[94]

The third element of claim 121 recites "provide a haptic feedback signal based at least in part on said haptic feedback information to a haptic feedback device, wherein said haptic feedback device outputs a tactile sensation based, at least in part, on said haptic feedback signal and correlated with said updated visual display." The specification further discloses that the haptic feedback information exchanged between the computers can be used to generate tactile sensations at the other computer.[95] It further discloses that the tactile sensations can be output to correlate with the update of the display of a graphical environment.[96]

The last element of claim 121 recites "send a second information over said computer network." For example, the specification discloses that each computer may transmit information relating to the "position, orientation, motion, or state characteristics" of an interface device to the other computer.[97] The specification also discloses sending information including haptic feedback information.[98]

Grounds of Rejection to be Reviewed on Appeal

There are two issues presented for appeal:

(1) Did the Examiner err in rejecting claims 12, 13, 17-23, 36-40, 42, 43, 58-70, 72-76, 78-82, 102-104, 106, 108-111, 113-116, 120, and 121 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 5,685,775 to Bakoglu et al ("Bakoglu") in view of U.S. Patent No. 5,299,810 to Pierce et al ("Pierce") and further in view of "Tele-Virtual Reality of Dynamic Mechanical Model" by M. Yamakita et al ("Yamakita")?

(2) Did the Examiner err in rejecting claims 14-15, 25, 92-96, 98-101, 105, and 107 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Bakoglu in view of Pierce and Yamakita and further in view of "MagicMouse: Tactile and Kinesthetic Feedback in the Human-Computer Interface using an Electromagnetically Actuated Input/Output Device" by A.J. Kelley

[94] *See*, e.g., Specification, p. 24, lines 1-25; Figures 12a-b.
[95] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.
[96] *See*, e.g., Specification, p. 23, lines 28-38; p. 24, lines 1-25; Figures 12a-b.
[97] *See*, e.g., Specification, p. 21, line 33 to p. 22, line 15.
[98] *See*, e.g., Specification, p. 15, lines 13-19; p. 23, lines 3-15; p. 25, line 13 to p. 27, line 25.

and S.E. Salcudean ("Kelley") and "A Low-Cost Force Feedback Joystick and its Use in PC Video Games" by Ming Ouhyoung et al ("Ouhyoung")?

Argument

Issue 1: Whether the Examiner erred in rejecting claims 12, 13, 17-23, 36-40, 42, 43, 58-70, 72-76, 78-82, 102-104, 106, 108-111, 113-116, 120, and 121 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Bakoglu in view of Pierce and Yamakita.

Because Bakoglu in view of Pierce and Yamakita does not disclose or suggest sending or receiving haptic feedback information between computers across a network as recited in claims 12, 13, 17-23, 36-40, 42, 43, 58-70, 72-76, 78-82, 102-104, 106, 108-111, 113-116, 120, and 121, each of these claims is patentable over the combined references.

To establish *prima facie* obviousness of a claimed invention under 35 U.S.C. § 103, the Office Action must show, either from the references themselves or in the knowledge generally available to one of ordinary skill in the art, that the cited references disclose or suggest each claimed element.[99]

The references cited by the Examiner do not teach sending or receiving haptic feedback between computers across a network. Bakoglu, the primary reference cited by the Examiner, discloses an add-on module for a video game console to allow multiple people to play the same game at the same time over a telephone connection. But, as noted by the Examiner, Bakoglu does not disclose or suggest haptic feedback.[100] Therefore, Bakoglu does not disclose or suggest sending or receiving haptic feedback information between computers across a network.

Pierce and Yamakita do not cure this deficiency. Pierce discloses a gaming system with two or more processors for allowing multiple players to play a tank-style game on a common virtual battlefield.[101] Each player has his own user console with a display, controls and a seat, and controls a vehicle capable of firing projectiles at other vehicles.[102] Each console has a processor for processing input signals from user controls, updating a visual display, and outputting haptic effects to the user through a solenoid embedded within a seat in the user

[99] *See Graham* v. *John Deere Co.*, 383 U.S. 1 (1966); *KSR Int'l Co.* v. *Teleflex, Inc.*, 82 U.S.P.Q.2d at 1395-96.
[100] *See* Non-Final Office Action, p. 5.
[101] *See*, Pierce, Abstract.
[102] *See* Pierce, col. 4, line 36 to col. 5, line 30.

console.[103] Each processor tracks the location of its respective vehicle and any projectiles fired by the vehicle.[104] In addition, each processor is coupled to a shared memory area where information about projectile locations is stored.[105] Thus, each processor can read the locations of other player's projectiles to determine whether any projectiles have struck its player's vehicle. If that occurs, the processor causes a haptic effect to be output to its user to indicate the user's vehicle has been struck by a projectile.[106]

However, Pierce does not disclose that haptic feedback information is shared. Rather, the only information shared is the position information of the vehicles and projectiles[107], and position information is not force feedback information.

The present specification distinguishes between haptic feedback information and information that can be used to determine whether to output a haptic effect. For example, the specification explains that

> if a button press on a joystick manipulandum of force feedback device 316 designates that a vibration is to be output on the other joystick manipulandum of force feedback device 326, a force feedback command or other similar information can be sent from computer 312 to computer 322, **preferably including parameters describing the vibration feel sensation**. Computer 322 parses and interprets the command and then commands the force feedback device 326 to output the vibration on the joystick.[108]

However, this type of information is different from other information that may be used by a receiving computer to determine whether a haptic effect should be output:

> Alternatively, the computer 312 can simply send the button press information, so that the computer 322 interprets the button press as a particular force sensation and outputs that sensation.[109]

Thus, the shared location information disclosed in Pierce is not the same as force feedback information.

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[103] *Id.*
[104] *See* Pierce, col. 7, lines 53-59; col. 8, lines 17-35.
[105] *Id.*
[106] *See* Pierce, col. 8, lines 61-67.
[107] Applicant also disputes the characterization of shared memory as a "network."
[108] Specification, p. 23, lines 6-12.
[109] Specification, p. 23, lines 15-17.

Finally, like Pierce, Yamakita does not disclose transmitting force feedback information. Yamakita discloses sending state information across a network. Yamakita discloses that state information received by a system can then be used by the system to determine if and how a haptic effect should be output.[110] Thus, Yamakita discloses transmitting information about the state of objects in the environment rather than haptic feedback information.

Thus, alone or in combination, Bakoglu, Pierce, and Yamakita do not disclose or suggest sending or receiving haptic feedback between computers information across a network.

Each of independent claims 12, 17, 38, 58, 75, 102, 103, 120, and 121 recite sending or receiving haptic feedback information across a network. As discussed above, the combination of Bakoglu, Pierce, and Yamakita do not disclose or suggest such a feature. Therefore, independent claims 12, 17, 38, 58, 75, 102, 103, 120, and 121 are each patentable over the combined references.

Applicant respectfully requests the Board reverse the Examiner's rejection of claims 12, 17, 38, 58, 75, 101, 102, 103, 120, and 121.

Claims 13, 18-23, 36, 37, 39, 40, 42, 43, 59-70, 72-74, 76, 78-82, 104, 106, 108-111, and 113-116 depend from and further limit one of claims 12, 17, 38, 58, 75, 102, 103, 120, and 121. Therefore, each of claims 13, 18-23, 36, 37, 39, 40, 42, 43, 59-70, 72-74, 76, 78-82, 104, 106, 108-111, and 113-116 are patentable over Bakoglu in view of Pierce and Yamakita. Applicant respectfully requests the Board reverse the Examiner's rejection of claims 13, 18-23, 36, 37, 39, 40, 42, 43, 59-70, 72-74, 76, 78-82, 104, 106, 108-111, and 113-116.

Issue 2: Whether the Examiner erred in rejecting claims 14-15, 25, 92-96, 98-101, 105, and 107 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Bakoglu in view of Pierce, Yamakita, Kelley and Ouhyoung.

Because Bakoglu in view of Pierce, Yamakita, Kelley, and Ouhyoung does not disclose or suggest sending or receiving haptic feedback information between computers across at network as recited in claims 14-15, 25, 92-96, 98-101, 105, and 107, each of these claims is patentable over the combined references.

[110] *See* Yamakita, Section 3.2, pages 1106-1107.

To establish *prima facie* obviousness of a claimed invention under 35 U.S.C. § 103, the Office Action must show, either from the references themselves or in the knowledge generally available to one of ordinary skill in the art, that the cited references disclose or suggest each claimed element and that it would have been obvious under *Graham* v. *John Deere Co.* to modify the references or to combine teachings in the references to arrive at the claimed invention. *See* MPEP §§ 2141 and 2143; *Graham* v. *John Deere Co.*, 383 U.S. 1 (1966); *KSR Int'l Co.* v. *Teleflex, Inc.*, 82 U.S.P.Q.2d at 1395-96. [111]

As discussed above, the combination of Bakoglu, Pierce, and Yamakita do not disclose or suggest sending or receiving haptic feedback information across a network. The addition of Kelley and Ouhyoung do not cure this deficiency. [112]

Kelley discloses an interface device capable of outputting haptic effects. However, Kelley does not discuss sending or receiving haptic feedback information between computers across a network.

Similarly, Ouhyoung discloses a joystick device capable of outputting haptic effects. However, Ouhyoung also does not discuss sending or receiving haptic feedback information between computers across a network. [113]

Thus, 14-15, 25, 92-96, 98-100, 105, and 107 do not disclose or suggest sending or receiving haptic feedback information between computers across at network.

Of the claims rejected under this combination of references, only claim 101 is an independent claim. Claim 101 recites "determining a haptic effect to be output based at least in part on haptic information received from said second computer." For the reasons given above, claim 101 is patentable over Bakoglu in view of Pierce, Yamakita, Kelley and Ouhyoung. Applicant respectfully requests the Board reverse the Examiner's rejection of claim 101.

As discussed above, each of independent claims 12, 17, 38, 58, 75, 102, 103, 120, and 121, from which claims 14-15, 25, 92-96, 98-100, 105, and 107 depend, recite sending or receiving haptic feedback information between computers across a network. As discussed above, Bakoglu in view of Pierce, Yamakita, Kelley and Ouhyoung does not disclose or suggest such a feature. Therefore, claims 14-15, 25, 92-96, 98-100, 105, and 107 are each patentable

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[111] *See Graham* v. *John Deere Co.*, 383 U.S. 1 (1966); *KSR Int'l Co.* v. *Teleflex, Inc.*, 82 U.S.P.Q.2d at 1395-96.
[112] *See*, Kelley, Abstract.
[113] *See*, Ouhyoung, Abstract.

over the combined references. Applicant respectfully requests the Board reverse the Examiner's rejection of claims 14-15, 25, 92-96, 98-100, 105, and 107.

Conclusion

In view of the foregoing arguments, Applicant respectfully asserts that each of the Examiner's rejections is in error and respectfully requests the Board reverse each ground of rejection.

Respectfully submitted,

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Appendix A – Claims

12. A system comprising:

a first computer means coupled to a network means; and

a second computer means coupled to said network means, said second computer means remote from said first computer means, said second computer means configured to produce a graphical environment, wherein said graphical environment is based, at least in part, on information transferred from said first computer means to said second computer means over said network means, and human/computer interface means, wherein said human/computer interface means comprises an actuator means, said second computer means further comprising means for interpreting haptic feedback information repeatedly received from said first computer means over said network means, updating said graphical environment based, at least in part, on said information, and causing said actuator to generate a physical feel sensation at said human/computer interface means based, at least in part, on said haptic feedback information.

13. A system as recited in claim 12 wherein said second computer means input comprises at least one of a position input for said human/computer interface device, and a button click input.

14. A system as recited in claim 12 wherein said human/computer interface means coupled to said second computer means includes a local controller means that communicates with said second computer means, a plurality of said actuator means for providing said physical feel sensations.

15. A system as recited in claim 14 wherein said second computer means sends a force feedback command to said local controller means that can be parsed by said local controller means such that said controller means can control said actuator means in response to said force feedback command in a control loop with said sensor means.

17. A method for providing haptic feedback, comprising:

receiving a remote computer information from a first computer at a second computer over a network, wherein said first computer is remote from said second computer, and wherein

said remote computer information comprises information representing haptic feedback information ,

generating a graphical environment;

receiving an input information at said second computer from a haptic feedback device; and

causing a haptic feedback signal to be provided to said haptic feedback device from said second computer, said haptic feedback signal being based, at least in part, on said remote computer information and said input information, wherein said haptic feedback signal causes said haptic feedback device to output haptic feedback.

18. A method as recited in claim 17 wherein said haptic feedback information of said remote computer information includes haptic feedback information indicating a tactile sensation to be output by said second haptic feedback device.

19. A method as recited in claim 17 further comprising sending second computer information from said second computer to said first computer over said network, said second computer information comprising information representing haptic feedback information.

20. A method as recited in claim 19 wherein said second computer information includes said input information from said second haptic feedback device and a tactile sensation to be output by said first haptic feedback device.

21. A method as recited in claim 17 wherein said graphical environment includes a first graphical object controlled by a user of said first haptic feedback device, and a second graphical object controlled by a user of said second haptic feedback device.

22. A method as recited in claim 21 wherein said first and second graphical objects are paddles.

23. A method as recited in claim 21 wherein said first and second graphical objects are displayed in a web page.

25. A method as recited in claim 17 wherein said second haptic feedback device includes a local controller that communicates with said second computer, wherein said local controller parses a haptic feedback command sent by said second computer such that said local haptic can control said actuator in response to said haptic feedback command in a control loop with at least one sensor of said second haptic feedback device.

36. A method as recited in claim 38 wherein said first computer receives a first input information from said first haptic feedback device in response to a manipulation of said first haptic feedback device, and wherein said second computer receives a second input information from said second haptic feedback device in response to a manipulation of said second haptic feedback device.

37. A method as recited in claim 36 wherein said haptic feedback signal from said first computer and said second computer is based, at least in part, on said input information from said first haptic feedback device and said second haptic feedback device, respectively.

38. A method for providing haptic feedback between a first computer and a second computer comprising:

sending a first computer information to said second computer over a network, wherein said first computer information comprises haptic feedback information , wherein said first computer is remote to said second computer;

causing a first haptic feedback signal to be sent to a second haptic feedback device from said second computer, said first haptic feedback signal being based, at least in part, on said first computer information, wherein said first haptic feedback signal causes said second haptic feedback device to output a haptic sensation;

sending a second computer information to said first computer over said network, wherein said second computer information comprises a position of a manipulandum of a second haptic feedback device; and

causing a second haptic feedback signal to be sent to said first haptic feedback device from said first computer, said second haptic feedback signal being based, at least in part, on said

second computer information, wherein said haptic feedback signal causes said first haptic feedback device to output a haptic sensation.

39. A method as recited in claim 38 wherein said first computer information includes haptic feedback information indicating a tactile sensation to be output by said second haptic feedback device, and wherein said second computer information includes haptic feedback information indicating a tactile sensation to be output by said second haptic feedback device.

40. A method as recited in claim 39 wherein said first computer and said second computer each produce a graphical environment having a first graphical object controlled by a first user and a second graphical object controlled by a second user.

42. A method as recited in claim 38 further comprising accessing a server computer with one of said first and second computers and downloading a feel sensation information from said server computer, said feel sensation information to be included in said first computer information or said second computer information.

43. A method as recited in claim 42 wherein said server computer provides a web page to said computer accessing said server, said web page including an embedded feel sensation information.

58. A method for providing haptic feedback comprising:

receiving a first computer information from a first computer at a server computer over a network;

providing said first computer information to a second computer, wherein said first computer is remote from said second computer, wherein said first computer information comprises haptic feedback information and information operable to update a simulated graphical object in a graphical environment output by said second computer, and wherein at least one of said second computer and said server computer uses said first computer information to update a game program running on at least one of said second computer and said server computer, and

wherein said second computer provides a second haptic feedback signal based at least in part on said first computer information to a second haptic feedback device;

receiving a second computer information from said second computer over said network; and

providing said second computer information to said first computer, wherein said second computer information comprises haptic feedback information and information operable to update a simulated graphical object in a graphical environment output by said first computer, and wherein at least one of said first computer and said server computer uses said second computer information to update a game program running on at least one of said first computer and said server computer, and wherein said first computer provides a first haptic feedback signal based at least in part on said second computer information to a first haptic feedback device.

59. A method as recited in claim 58 wherein said haptic feedback information of said first computer information includes force information describing a tactile sensation, wherein said tactile sensation is output by said second haptic feedback device.

60. A method as recited in claim 58 further comprising sending tactile sensation data stored on said server computer to said first computer.

61. A method as recited in claim 58 wherein said first computer information comprises position data allowing said second computer to display a graphical object in said graphical environment output by said second computer.

62. A method as recited in claim 58 wherein said server computer runs a web page.

63. A method as recited in claim 58 wherein updating said game program running on said first computer includes updating a location of a displayed player graphical object based at least in part on said second computer information.

64. A method as recited in claim 58 wherein said updating of said game program running on said first computer includes updating a location of a projectile.

65. A method as recited in claim 64 wherein said projectile is a ball or a puck.

66. A method as recited in claim 63 wherein said displayed player graphical object represents a sporting object.

67. A method as recited in claim 66 wherein said displayed player graphical object includes a weapon.

68. A method as recited in claim 63 wherein a collision between said player graphical object and a different graphical object is detected, and wherein said first haptic feedback signal is based at least in part on said detected collision.

69. A method as recited in claim 68 wherein said different graphical object is a projectile.

70. A method as recited in claim 68 wherein said different graphical object is an obstruction in said game environment.

72. A method as recited in claim 75 wherein said first computer is a client computer and said second computer is a server computer.

73. A method as recited in claim 75 wherein said first computer and said second computer are client computers.

74. A method as recited in claim 75 wherein said first information received from said second computer includes web page information.

75. A method for providing haptic feedback over a computer network comprising:

receiving a first information from a remote computer over a network, said first information comprising haptic feedback information and position information for a graphical object displayed by said remote computer;

using said first information to update a visual display

providing a haptic feedback signal based at least in part on said haptic feedback information to a haptic feedback device, wherein said haptic feedback device outputs a tactile sensation based, at least in part, on said haptic feedback signal and correlated with said updated visual display; and

sending a second information to said remote computer over said network.

76. A method as recited in claim 73 wherein said haptic feedback device is a first haptic feedback device, and wherein said remote computer includes a second haptic feedback device providing computer-controlled physical tactile sensations to a user of said second haptic feedback device.

78. A method as recited in claim 75 wherein said visual display is updated by moving a graphical object within a graphical game environment based, at least in part, on position data received from said haptic feedback device, where a collision between said graphical object and a different graphical object can detected to cause said tactile sensation to be output.

79. A method as recited in claim 75 wherein said first information comprises an indication of a gaming event, and further comprising synchronizing said visual display associated with said gaming event with said tactile sensation that is associated with said gaming event.

80. A method as recited in claim 79 wherein said gaming event is a collision.

81. A method as recited in claim 79 wherein said gaming event is an explosion.

82. A method as recited in claim 79 wherein said visual display is updated at a rate substantially faster than said tactile sensation.

92. A method as recited in claim 101 wherein said local model of said particular client computer also receives button data from said associated haptic feedback device, said button data describing a state of at least one button on said associated haptic feedback device.

93. A method as recited in claim 101 wherein said first graphical object is a representation of sporting equipment.

94. A method as recited in claim 93 wherein said second graphical object is a representation of a ball or puck.

95. A method as recited in claim 101 wherein said first graphical object includes a representation of a weapon.

96. A method as recited in claim 101 wherein each of said local models of said computer-gaming simulation of said multiple client computers displays a graphical object having a location influenced by position data received from an associated interface device in communication with each client computer.

98. A method as recited in claim 101 wherein a sound is associated with an event occurring in said computer-gaming simulation, wherein said computer synchronizes an output of said sound with said tactile sensation that is associated with said event.

99. A method as recited in claim 98 wherein said event is a collision in said computer-gaming simulation.

100. A method as recited in claim 98 wherein said event is an explosion in said computer-gaming simulation.

101. A method comprising:

executing a first local model of a computer-gaming simulation on a first computer in communication with a network;

executing, substantially simultaneously with said first local model, a second local model of said computer-gaming simulation on a second computer in communication with said first computer over said network, said second computer remote from said first computer;

updating a location of a first graphical object of said first local model based at least in part on position data output by a sensor in communication with a haptic input device in communication with said first computer, said haptic input device comprising an actuator configured to output haptic feedback to said haptic input device;

updating a location of a second graphical object based at least in part on information received over said Internet from said second network interface of said second computer, said information comprising a gaming event; and

determining, by said first computer, whether said first graphical object and said second graphical object interact, and, if so:

determining a haptic effect to be output based at least in part on haptic information received from said second computer, and

outputting said haptic effect to said haptic input device, said haptic effect configured to be substantially synchronized with said gaming event.

102. A system comprising:

a first computer, said first computer comprising:

a first processor in communication with a network,

a first memory coupled to said first processor,

a first force feedback device in communication with said first processor, said first force feedback device configured to provide a first input signal, said first force feedback device coupled to a first actuator, said first actuator configured to provide tactile sensations in response to a first haptic feedback signal, and

wherein said first processor is configured to:

produce a first image, and

provide said first haptic feedback signal to said first force feedback device, said first image and said first haptic feedback signal based at least in part on a first information received from a second computer over said network and based at least in part on said first input signal, said first information comprising haptic feedback information; and

said second computer remote from said first computer, said second computer comprising:

a second processor,

in communication with a network,

a second memory coupled to said second processor,

a second force feedback device coupled to said second processor, said second force feedback device configured to provide a second input signal, said second force feedback device coupled to a second actuator, said second actuator configured to provide a tactile sensation in response to a second haptic feedback signal, and

wherein said second processor is configured to:

produce a second image, and

provide said second haptic feedback signal to said second interface device, said second image and said second haptic feedback signal based at least in part on a second information received from said first computer over said network and based at least in part on said second input signal, said second information comprising haptic feedback information.

103. A system comprising:

a first computer, comprising:

a first processor capable of generating a first image signal, said first processor in communication with a network,

a first force feedback device capable of providing a first input signal, comprising:

a first actuator configured to provide tactile sensations in response to a first haptic feedback signal, and

said first image signal and said first haptic feedback signal based at least in part on a first information received from a second computer over said network and based at least in part on said first input signal, said first information comprising haptic feedback information; and

said second computer remote from said first computer, said second computer, comprising:

a second processor capable of generating a second image signal,

said second processor in communication with said network,

a second force feedback device capable of providing a second input signal to said second processor, comprising:

a second actuator configured to provide tactile sensations in response to a second haptic feedback signal, and

said second image and said second haptic feedback signal based at least in part on

a second information received from said first computer over said network and based at least in part on said second input signal, said second information comprising haptic feedback information.

104. A system as recited in claim 103 wherein said first force feedback device is coupled to a manipulandum configured to move in two degrees of freedom.

105. A system as recited in claim 104 wherein said first force feedback device is coupled to a third processor, said third processor in communication with said first processor, and said first force feedback device includes a local controller that communicates with said first computer, a plurality of actuators for providing said tactile sensations, and at least one sensor for sensing positions of said manipulandum.

106. A system as recited in claim 104 wherein said manipulandum is manipulable by a finger of a user.

107. A system as recited in claim 105 wherein said haptic feedback signal includes a haptic feedback command that can be parsed by said local controller such that said controller can control said actuators in response to said haptic feedback command in a control loop with said sensors.

108. A system as recited in claim 103 wherein said first computer and said second computer communicate with at least one server computer over said network, wherein said information received from said first computer and said information received from said second computer are communicated via said server.

109. A system as recited in claim 103 wherein said first image includes a graphical object that can interact with a projectile.

110. A system as recited in claim 103 wherein said first image comprises a first graphical object and a second graphical object, said first graphical object having a location based, at least in part, on a position information received from said first force feedback device, said first

graphical object able to collide with said second graphical object said second graphical object having a location based at least in part on said first information received from said second computer.

111. A system as recited in claim 103 wherein said first image includes a graphical object having a location based, at least in part, on position information received from first second force feedback device, said graphical object able to collide with an obstruction displayed in said first image.

113. A device as recited in claim 120 further comprising a visual display coupled to said processor, said visual display configured to display a first graphical object based at least in part on said first information.

114. A device as recited in claim 120 wherein said first information is received from a server computer over said network.

115. A device as recited in claim 120 wherein said first information is received from a client machine over said network.

116. A device as recited in claim 114 wherein said server computer and said processor communicate over said network using TCP/IP protocols.

120. A device comprising:

a processor configured to:

receive a first information from a remote processor over a network, said first information comprising haptic feedback information and position information for a graphical object to be displayed,

update a visual display coupled to said processor based at least in part on said first information;

generate a haptic feedback signal based at least in part on said haptic feedback information, said haptic feedback signal configured to cause a haptic feedback device to output a

tactile sensation based at least in part on said haptic feedback signal and correlated with said updated visual display; and

transmit a second information over said computer network.

121. A computer-readable medium comprising program code to cause a processor to perform the steps of:

receive a first information from a remote processor over a network, said first information comprising haptic feedback information and position information for a graphical object displayed by said second computer;

update a visual display based at least in part on said first information;

provide a haptic feedback signal based at least in part on said haptic feedback information to a haptic feedback device, wherein said haptic feedback device outputs a tactile sensation based, at least in part, on said haptic feedback signal and correlated with said updated visual display; and

send a second information over said network.

Appendix B – Evidence

None.

Appendix C – Related Proceedings

None.